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In [93]: import numpy as np
import math116
import scipy
from scipy import optimize
import math
```

```
In [94]: n_1=1067630413187841523694537298073305552274776079802902672351039
n_2=741591202370072789953706745485666075004784174022368180242037
n_3=667336142291948937637980407048251181747364391891428340555141
N=n_1*n_2*n_3
```

```
In [95]: c_1=529845560668797629400939585461719431833561498816920423702247
c_2=169291735293877329351269953081439652585988812455417922505176
c_3=642418962414073836488116737694096521023718712673159264182195
```

```
In [96]: y_1=N//n_1
y_2=N//n_2
y_3=N//n_3
```

```
In [97]: z_1=math116.inverse(y_1,n_1)
z_2=math116.inverse(y_2,n_2)
z_3=math116.inverse(y_3,n_3)
```

```
In [98]: m_3=(c_1*y_1*z_1+c_2*y_2*z_2+c_3*y_3*z_3)%N
```

```
In [84]: f = lambda x: x**3-m_3
```

```
In [99]: m_3
```

```
Out[99]: 12249739749784771985364504924805398662123078918189011371891240923288000
```

```
In [110]: def bisection(f,a,b,tol=1):
    if np.sign(f(a))==np.sign(f(b)):
        print('a and b do not bound a root')
    m=(a+b)//2
    if abs(f(m))<tol:
        return m
    elif np.sign(f(a))==np.sign(f(m)):
        return bisection(f,m,b,tol=1)
    elif np.sign(f(b))==np.sign(f(m)):
        return bisection(f,a,m,tol=1)
```

```
In [111]: bisection(f,m_0,m_3)
```

```
Out[111]: 230520182119202018051420
```

```
In [112]: math116.num_to_text(230520182119202018051420)
```

```
Out[112]: 'WETRUSTTRENT'
```

```
In [102]: m=int(pow(m_3,1/3))
```

```
Out[102]: 2.305201821192013e+23
```

```
In [33]: a=2
i=2
n=3082787780076703322597022112433309015881410588015304163
while True:
    a=pow(a,i,n)
    p=math116.gcd(a-1,n)
    if p>1:
        print(p)
        break
    i+=1
```

```
3994211774931437561721507289
```

```
In [34]: q=n//p
```

```
In [35]: phi_n=(p-1)*(q-1)
```

```
In [36]: d=math116.inverse(65537,phi_n)
```

```
In [39]: c=1409434396818034663404225667133198898377678131865927114
pow(c,d,n)
```

```
Out[39]: 805250221040425
```

```
In [46]: pow(3,1234,53047)
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```
Out[46]: 8576
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In [48]: pow(2,2000,3989)
```

```
Out[48]: 3925
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```
In [50]: pow(2,3000,3989)
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```
Out[50]: 1046
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```
In [51]: pow(2,1012,3989)
```

Out[51]: 869

In [52]: `(3925*1046)%3989`

Out[52]: 869

In [17]: `math116.num_to_text(805250221040425)`

Out[17]: 'HEYBUDDY'

In []: